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Pillsbury Winthrop Shaw Pittman, LLP
PO Box 10500
McLean, VA 22102

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BHASKAR S. RAMAMURTHY, NEAL A. TANNER, ROBERT G. YOUNGE, and RANDALL L. SCHLESINGER

Appeal 2018-001216
Application 13/602,921
Technology Center 1600

Before JEFFREY N. FREDMAN, ERICA A. FRANKLIN, and DAVID COTTA, *Administrative Patent Judges*.

FREDMAN, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal[1,2] under 35 U.S.C. § 134(a) involving claims to an instrument system. The Examiner rejected the claims as anticipated. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the Real Party in Interest as Koninklijke Philips N.V. (*see* App. Br. 3).

[2] We have considered and refer to the Specification of Sept. 4, 2012 ("Spec."); Final Office Action of June 1, 2016 ("Final Action"); Appeal Brief of Dec. 12, 2016 ("App. Br."); Supplemental Appeal Brief of Jan. 27, 2017 ("Supp. App. Br."); Examiner's Answer of Sept. 15, 2017 ("Ans."); and Reply Brief of Nov. 14, 2017 ("Reply Br.").

Statement of the Case

Background

"Robotic interventional systems and devices are well suited for use in performing minimally invasive medical procedures as opposed to conventional procedures that involve opening the patient's body to permit the surgeon's hands to access internal organs" (Spec. ¶ 5). "However, controlling one or more catheters that are advanced through naturally-occurring pathways such as blood vessels or other lumens via surgically-created wounds of minimal size, or both, can be a difficult task" (*id.* ¶ 12). "These difficulties are due in part to limited control of movement and articulation of system components, associated limitations on imaging and diagnosis of target tissue, and limited abilities and difficulties of accurately determining the shape and/or position of system components and distal portions thereof within the patient" (*id.*).

The Claims

Claims 6 and 8–10 are on appeal.[3] Claim 6 is the sole independent claim and reads as follows:

> 6. An instrument system, comprising:
>
> an elongate body having a distal portion, the elongate body operatively coupled to an optical fiber having a strain sensor provided thereon;
>
> a controller operatively coupled to the elongate body and configured to receive a plurality of signals from the strain sensor, the controller configured to:

[3] Claims 1–5 were withdrawn as non-elected, claims 7, 12, 16–27 were cancelled, and claims 11, and 13–15 were indicated as allowable (*see* Ans. 2).

> detect, at a plurality of instances, contact between the distal portion of the elongate body and an internal structure of the patient by maneuvering the distal portion of the elongate body near the internal structure of the patient, wherein the plurality of signals received from the strain sensor correspond to the plurality of instances;
>
> determine a plurality of geometric configurations of the distal portion of the elongate body, the plurality of geometric configurations corresponding to the plurality of instances of detected contact between the distal portion of the elongate body and the internal structure of the patient, wherein the plurality of geometric configurations are determined based on the plurality of signals received from the strain sensor;
>
> determine a plurality of positions of the distal portion of the elongate body, the plurality of positions corresponding to the plurality of determined geometric configurations; and
>
> generate a structural map of the internal structure of the patient based on the plurality of determined positions of the distal portion of the elongate body.

The Rejections

A. The Examiner rejected claims 6 and 8–10 under 35 U.S.C. § 102(a) and (e) as anticipated by Larkin[4] (Ans. 3–5).

B. The Examiner rejected claims 6 and 8–10 under 35 U.S.C. § 102(b) as anticipated by Bucholtz[5] (Ans. 6–8).

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[4] Larkin et al., US 2007/0156019 A1, published July 5, 2007.
[5] Bucholtz, WO 01/33165 A1, published May 10, 2001.

A. 35 U.S.C. § 102(a) and (e) over Larkin

The Examiner finds

> Larkin teaches a positionable medical instrument assembly (Figures 1-3) comprising components for tracking positions of the instrument, comprising a plurality of positionable members . . . [and] an optical fiber sensor (Bragg sensor optical fiber 220; paragraphs 48 and 54) coupled to the first, second and third members, such that the relative movement of the first and second members . . . causes a corresponding bending of the Bragg sensor optical fiber.

(Ans. 3). The Examiner finds Larkin teaches "optical reading of the Bragg sensors relative to the movement of the joints determine strain" (*id.*). The Examiner finds Larkin teaches the "Bragg sensor optical fiber having a proximal end operatively coupled to a controller (250) is configured to analyze the signals and determine a relative position . . . and display a graphical representation of the instrument body" (*id.* 3–4).

The issue with respect to this rejection is: Does a preponderance of the evidence of record support the Examiner's conclusion that Larkin anticipates the claims?

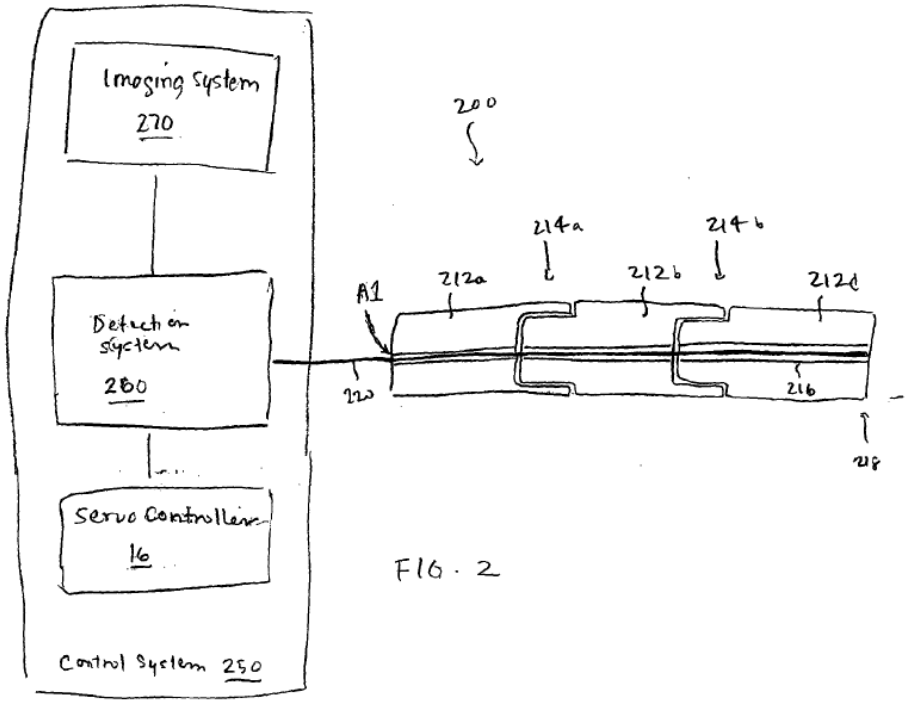
Findings of Fact

1. Larkin teaches a surgical instrument that comprises a "detection system . . . comprising a light source and a light detector for detecting light reflected by or transmitted through the optical fiber bend sensor to determine a position of at least one joint region of the at least one articulatable arm" (Larkin ¶ 18).

2. Larkin teaches the optical fiber "comprises three cores contained within a single cladding . . . An array of Fiber Bragg Gratings is provided within each core. Each Fiber Bragg Grating comprises a series of modulations of the core's refractive index so as to generate a spatial

periodicity in the refraction index" (Larkin ¶¶ 47–48).

3. Figure 2 of Larkin is reproduced below:



> FIG. **2** shows a simplified block diagram of a surgical instrument **200** . . . The instrument **200** includes an elongate body comprising a plurality of body segments **212** coupled to adjacent body segments **212** via joint regions **214**. Each joint region **214** may provide, one, two, or more degrees of freedom for the instrument **200**. A channel **216** passes through the elongate body **210**, and an optical fiber **220** is provided within the channel **216**. A sensor control system **250** is coupled to a proximal end of the optical fiber **220**.

(Larkin ¶ 43).

4. Larkin teaches "the manipulator assemblies **4** may operate a viewing scope assembly **19** (e.g., in endoscopic procedures) for viewing the surgical site" (Larkin ¶ 34).

5. Larkin teaches

> FBG [fiber Bragg grating] sensors may be used to locate a portion of a surgical instrument (e.g., the tip of the

> instrument) in a fixed external coordinate system in order to combine external data (such as image data from a magnetic resonance imaging (MRI) or ultrasound imaging system) with the positioning information to assist the operator in performing the surgical procedure.
>
> For example, the detection system **260** may be coupled to the imaging system **270** to provide real-time position information for use in the control of the instrument **200**. The imaging system **270** may include image data of the patient from an external source, such as a pre-operative MRI. The proximal end of the instrument **200** can then be supported by the surgical system **2** in a known position relative to the patient. Thus, one end of the sensing fiber may have a fixed position and angular orientation in a coordinate system external to the patient. For example, in a surgical robot, the proximal end of the fiber may be fixed to the frame holding the apparatus, which would be fixed in position relative to the patient during a period of use. As described above, the detection system **260** can then utilize the FBG sensors to determine the angles of all the joint regions in the instrument, including those that are not actively controlled. This information can then be combined with the known lengths of the structure's links to determine the position and orientation of each portion of the instrument.

(Larkin ¶¶ 99–100).

Principles of Law

For a prior art reference to anticipate a claim, it must disclose all of the limitations of the claim, "arranged or combined in the same way as in the claim." *Wm. Wrigley Jr. Co. v. Cadbury Adams USA LLC*, 683 F.3d 1356, 1361 (Fed. Cir. 2012).

"[P]rogramming creates a new machine, because a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software." *Ultramercial, LLC v. Hulu, LLC*, 657 F.3d 1323, 1328–29 (Fed. Cir. 2011).

Analysis

Appellant contends

> nowhere does Larkin disclose, teach or suggest "determining tissue characteristics" as alleged in the Office Action. In fact, Appellant submits that Larkin has nothing to do with aspects of generating a structural map of the internal structure of the patient or with the concerns of the present patent application. Larkin merely discloses a surgical instrument having an articulatable arm with one or more joint regions.

(App. Br. 7). Appellant contends "the controller of Larkin does not generate a ***structural map of the internal structure of the patient based on*** the plurality of determined positions of the distal portion of the elongate body" (*id.*).

The Examiner responds that

> the phrase "configured to" is generic and as such is subject to the required broadest reasonable interpretation standard. As long as the prior art reasonably teaches structures that are "configured to" perform the claimed function or teaches that the claimed function is carried out by generic structures, then the limitations of the claim function is met.

(Ans. 11).

We agree with Appellant. When functional language is associated with programming or some other structure required to perform the function, that programming or structure must be present in order to meet the claim limitation. *Typhoon Touch Techs., Inc. v. Dell, Inc.*, 659 F.3d 1376, 1380 (Fed. Cir. 2011); *See also Ultramercial, LLC v. Hulu, LLC*, 657 F.3d 1323, 1328–29 (Fed. Cir. 2011) ("[P]rogramming creates a new machine, because a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software.”).

Therefore to anticipate, Larkin must teach a controller that includes the specific programming necessary: to detect “contact between the distal portion of the elongate body and an internal structure of the patient”; to determine “geometric configurations” and “positions” based on the contact; and to “generate a structural map of the internal structure of the patient based on the plurality of determined positions” as required by claim 6.

Even if Larkin were broadly read to detect contact and determine geometric positions based on the position of the optical fiber as it is constrained by contact with internal structures of a patient during surgery (FF 2–4), Larkin does not teach the step of generating a structural map of the internal structure of the patient. At best, Larkin teaches the location of the surgical device itself (FF 5) but provides no structural map of the internal structure of the patient. We therefore agree with Appellant that Larkin does not anticipate the claims.

Conclusion of Law

A preponderance of the evidence of record does not support the Examiner’s conclusion that Larkin anticipates the claims.

B. 35 U.S.C. § 102(b) over Bucholtz

The Examiner finds Bucholtz teaches

> a medical instrument system (pages 1, 3, 20, and 23) comprising an elongate instrument body . . . [and an] optical fiber including one or more Bragg gratings (FBGs) (pages 5-7, 13-15; claims 6, 11, and 13), a detector operably coupled to a proximal end of the optical fiber and configured to detect respective light signals reflected by the one or more Bragg gratings (pages 14-18; Figures 3, 4A, 4B, and 4C; claims 1 and

7) and a controller

(Ans. 6). The Examiner interprets Bucholtz as teaching a device "being capable of generating a structural map of at least one internal structure of a patient (including, for example, a lumen)" (Ans. 7).

The issue with respect to this rejection is: Does a preponderance of the evidence of record support the Examiner's conclusion that Bucholtz anticipates the claims?

Findings of Fact

6. Bucholtz teaches "a system and method for surveying the three dimensional shape, orientation and position of an optical fiber, and therefore can provide corresponding information regarding the environment in which the optical fiber is positioned, such as a passageway or tubular object, including a catheter placed within the body," (Bucholtz 3).

7. Bucholtz teaches "changes in wavelength are measured in order to determine the flexure of the optical fiber array. Each of the optical fibers contain one or more fiber Bragg gratings ('FBG')" (Bucholtz 5).

8. Bucholtz teaches "If the fiber containing the FBG is subjected to a stress which causes the fiber to strain . . . the strain in the fiber can be related to the shape of the fiber array" (Bucholtz 6).

9. Bucholtz teaches "the fiber serves as a sensor of the local bend geometry and, provided the local bend geometry is known at a number of sufficiently closely-spaced locations, the shape, orientation and/or position of the fiber configuration can be determined" (Bucholtz 6).

10. Bucholtz teaches "software and a user interface are associated with computer 34 to determine the shape, orientation and/or position of array 18 and in turn, the shape, or configuration of the catheter or other object array 18 is within, and display this shape on display panel or monitor 36"

(Bucholtz 14).

11. Figures 9A-9C of Bucholtz are reproduced below:

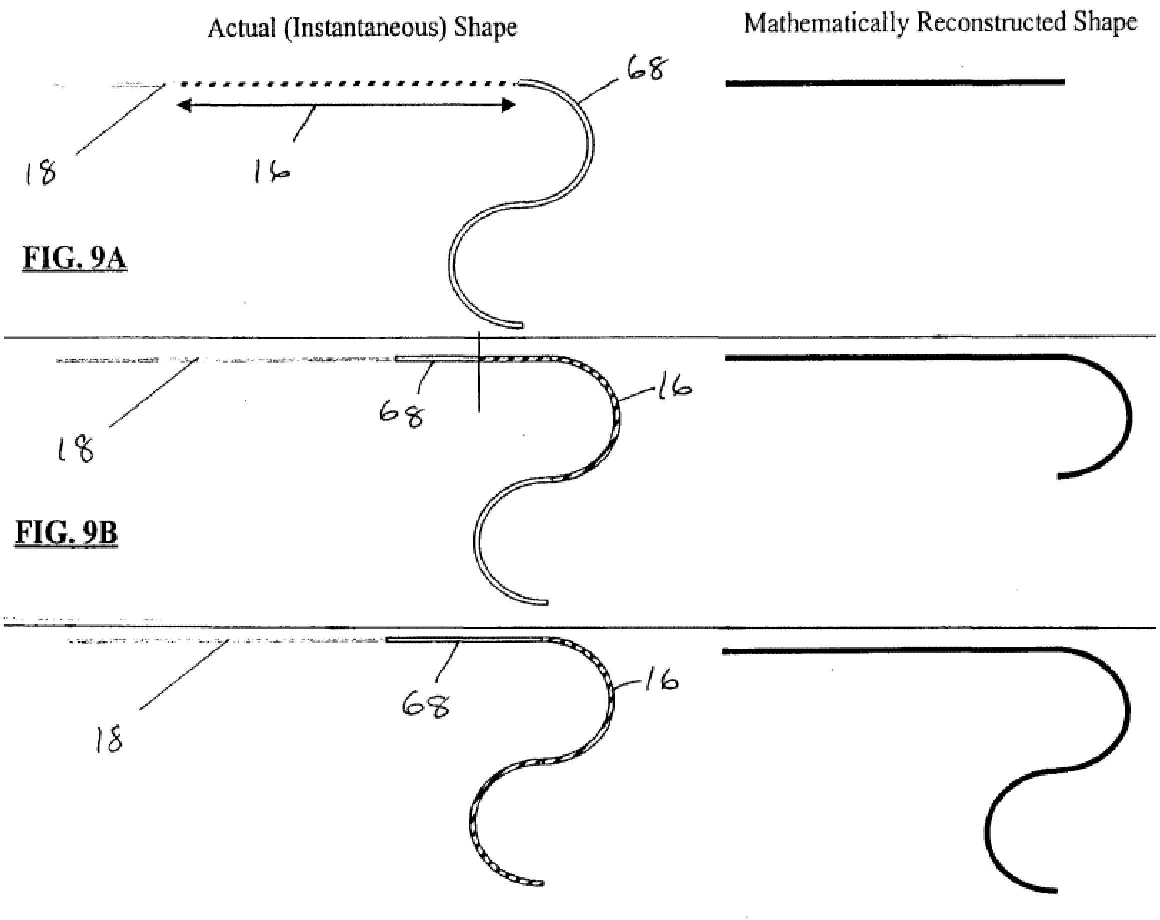


FIG. 9C

"Figs. 9A to 9C sequentially illustrate the mathematical reconstruction of the shape of a tubular object 68, as fiber array 18 is advanced into tubular object" (Bucholtz 20).

12. Bucholtz teaches:

> As shown in Fig. 9A, prior to insertion into tubular object 68, the fiber array 18 takes on the shape of this first curved portion, and the system of the present invention displays the linear shape of active portion 16. As active portion 16 of array 18 is inserted into the first curved portion of tubular object 68, once again fiber array 18 takes on this additional curved shape, and

> the system of the present invention generates the curved shape of active portion 16, as illustrated in Fig. 9B. As active portion 16 is further advanced into the second curved portion of tubular object 68, the present system generates the curved shape of object 68 and active portion 16, as shown in Fig. 9C.

(Bucholtz 20–21).

13. Bucholtz teaches that by "knowing the shape, orientation and/or position of the active length of the sensor at each of a number of insertion depths within the tubular object it is thereby possible to mathematically reconstruct the shape of the tubular object over a length much greater than the active length of the sensor" (Bucholtz 21).

Analysis

We adopt the Examiner's findings of fact and reasoning regarding the scope and content of the prior art (Ans. 6–8; FF 6–13) and agree that the claims are anticipated by Bucholtz. We address Appellant's arguments below.

We begin with claim interpretation, since before a claim is properly interpreted, its scope cannot be compared to the prior art. The phrase in claim 6 at issue is "detect . . . contact between the distal portion of the elongate body and an internal structure of the patient." In particular, the issue is how broadly or narrowly is the term "contact" interpreted? More particularly, does "detecting contact" encompass detecting contact based on the shape of the elongate body that results as the elongate body is constrained by the internal structure of the patient (a constraint necessarily involving contact or touching of the internal structure)?

We first turn to the Specification which is, "[i]n most cases, the best source for discerning the proper context of claim terms." *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1360 (Fed. Cir. 2004).

The Specification does not define the term "contact" and uses similar language as that of the claim when referencing "contact" (*see* Spec. ¶¶ 50, 51, 91). However, the Specification does state that "a geometric configuration of the distal end portion 211 of the instrument 210 is determined when the distal end 211 contacts the tissue surface, e.g., based on light reflected 226 by one or more FBGs 302" (Spec. ¶ 91). This teaching is reasonably understood as detecting contact using the shape that the elongate body takes based on the constraints of the internal patient structure, rather than detecting contact by sending a signal each time the elongate body contacts the patient.

During prosecution, the USPTO interprets terms in a claim using the broadest reasonable interpretation in light of the Specification. *See In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). In this case, the broadest reasonable interpretation of the phrase "detect . . . contact between the distal portion of the elongate body and an internal structure of the patient" encompasses detection of the shape of the elongate body using the fiber Bragg gratings based on the constraints imposed by the internal patient structure. We apply this interpretation to Bucholtz.

Appellant contends, "that the use of 'configured to' language in the present patent application must be fully evaluated as functional limitations and the 'configured to' language in the present patent application cannot be ignored" (App. Br. 11). Appellant contends that "[t]here is simply nothing in Bucholtz that teaches or even hints at its controller being configured to 'generate a structural map of the internal structure of the patient based on the plurality of determined positions of the distal portion of the elongate body'" (Reply Br. 5).

Appellant also contends that

> Bucholtz fails to disclose "contact between the distal portion of the elongate body and an internal structure of the patient," let alone detect such a contact at a plurality of instances. Bucholtz also fails to disclose the feature of "determine a plurality of positions of the distal portion of the elongate body . . . corresponding to the plurality of determined geometric configurations," which is "corresponding to the plurality of instances of detected contact between the distal portion of the elongate body and the internal structure of the patient." There is simply no mention of these features whatsoever in Bucholtz.

(App. Br. 12).

We agree that the "configured to" to language receives patentable weight. We disagree that Bucholtz fails to teach these features. Bucholtz anticipates even when the "configured to" language is properly given patentable weight. Bucholtz teaches an elongate body composed of an optical fiber with a fiber Bragg grating (FF 6–7) that functions as a strain sensor (FF 8). Bucholtz teaches a controller that is operatively coupled to the elongate body and configured to receive signals from the fiber Bragg grating sensor (FF 10).

Bucholtz further teaches the "configured to" requirements. In particular, consistent with our claim interpretation above, Bucholtz teaches the detection of "contact between the distal portion of the elongate body and an internal structure of the patient." This is evident from both figure 9A-C (FF 11) and Bucholtz' teaching that "the fiber array 18 takes on the shape of this first curved portion" (FF 12). In order for the fiber array 18 to take on the shape of the curved portion as it is moved into the curved portion, the fiber array necessarily contacts curved portion whose internal structure constrains the shape of the fiber array by touching or contacting the fiber array.

Bucholtz expressly teaches determining "the local bend geometry" because after that geometry is determined "at a number of sufficiently closely-spaced locations, the shape, orientation and/or position of the fiber configuration can be determined" (FF 9). Bucholtz teaches that these positions are determined using the strain sensor because "the strain in the fiber can be related to the shape of the fiber array" (FF 8).

Lastly, Bucholtz expressly teaches "software and a user interface are associated with computer 34 to determine the shape . . . and display this shape on display panel or monitor" (FF 10). This display of the shape on a monitor reasonably satisfies the claim requirement to "generate a structural map of the internal structure". Indeed, Figures 9A-C show a hypothetical example where the "mathematically reconstructed shape" is displayed and represents the internal structure of the lumen in which an optical fiber was inserted based on measurements using the fiber Bragg grating sensors (FF 12–13).

Therefore, while we agree with Appellant that the "configured to" language must be given patentable weight, we do not agree that Bucholtz fails to teach an instrument system that satisfies the "configured to" language of claim 6.

Conclusion of Law

A preponderance of the evidence of record supports the Examiner's conclusion that Bucholtz anticipates the claims.

CONCLUSION

In summary:

Claim(s) Rejected	Basis	Affirmed	Reversed
6, 8–10	§ 102(a) and (e) Larkin		6, 8–10
6, 8–10	§ 102(b) Bucholtz	6, 8–10	
Overall Outcome		6, 8–10	

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED